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A NEW HOST RECORD FOR *EURYTOMOCHARIS ERAGROSTIDIS* HOWARD (CHALCIDOIDEA:EURYTOMIDAE) INFESTING *ERAGROSTIS TEF* IN SOUTH DAKOTA

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Abstract.—The species *Eurytomocharis eragrostidis* is for the first time recorded from South Dakota infesting *Eragrostis tef* grown in the Americas. The female ovipositor, propodeum and male reproductive apparatus are illustrated.

Key Words: Hymenoptera, Eurytomidae, *Eurytomocharis eragrostidis* Teff, South Dakota

Stem-boring Hymenoptera infest cereal crops and numerous other grasses (Essig 1958). The genus *Eurytomocharis* was found to infest up to 30% of stems of several range grasses in New Mexico (Watts and Bellotti 1967). Bugbee (1966) redefined the genus *Eurytomocharis* and described 4 new species from stems of grasses.

Teff [*Eragrostis tef* (Zucc.) Trotter] is the primary grain crop of Ethiopia. This crop is currently being evaluated as a potential new forage crop for the northern Great Plains (Boe et al. 1986). Stunted growth of the crop in South Dakota in 1988 prompted dissection of stems that revealed larvae of *Eurytomocharis eragrostidis* Howard feeding inside. The observations and data reported here describe a new insect-plant relationship and the magnitude of infestation of teff by *E. eragrostidis* at 2 widely-separated South Dakota locations. Anatomical descriptions, illustrations of male and female genitalia and additional morphological structures are presented to assist in the identification of *E. eragrostidis.*

Materials and Methods

In late July 1988, 7 random teff plants from each of 4 replications in field trials at Brookings and Highmore, South Dakota, were examined for infestation by *E. eragrostidis.* The trials were planted on 17 May and 1 June 1988 at Highmore and Brookings, respectively.

Tillers of each plant were slit longitudinally with a razor blade and numbers of larvae, pupae, and exit holes were determined for each mature internode. Approximately 30 internodes containing larvae or pupae were placed in small, covered glass jars and adults that emerged in the summer and fall of 1988 were collected for identification.

Results and Discussion

Plant–insect interaction.—*E. eragrostidis* infested a high percentage of teff tillers at both South Dakota locations in 1988. Individual tillers frequently had more than one infested internode, resulting in 28 and 38% internode infestation at Brookings and Highmore, respectively (Table 1).

Watts and Bellotti (1967) reported that the 4 *Eurytomocharis* species found infesting range grasses in the southwestern United States had similar life cycles with only 1 generation per year on any given grass species. In South Dakota, exit holes were

Table 1. Infestation rates of teff by *Eurytomocharis eragrostidis* at two South Dakota locations in 1988.

	Numbers examined		Percent infested[1]	
Location	Tillers	Inter-nodes	Tillers	Inter-nodes
Highmore	132	449	72 ± 12	38 ± 4
Brookings	158	434	50 ± 7	28 ± 3

[1] Mean ± standard deviation of 4 replications.

found in approximately 30% of the infested teff internodes in late July (Fig. 1) and adults of *E. eragrostidis* emerged under laboratory conditions in August and September 1988. More research is needed to determine if a second generation can be produced on teff in South Dakota.

Teff had been grown at both locations for more than 5 years with no previous indication of stem-boring insect problems. *E. eragrostidis* has been previously reported from *Agropyron* spp., *Agrostis alba* L., *Andropogon saccharoides* Swartz, *Eragrostis cilianensis* (All.) Lutati., *E. erosa* Scribn., *E. poaeoides* Beauv. ex Roem. and Schult., *Muhlenbergia porteri* Scribn., *M. wrightii* Vasey, *Oryzopsis hymenoides* (Roem. and Schult.) Ricker, and *Sporobolus airoides* (Torr.) Torr. (Burks 1979).

Watts and Bellotti (1967) found *E. eragrostidis* most frequently on side-oats grama [*Bouteloua curtipendula* (Michx.) Torr.] in New Mexico. *E. cilianensis* and side-oats grama occur commonly throughout South Dakota, but more study is needed to determine if these species are hosts of *E. eragrostidis* in the northern Great Plains.

Several parasitic chalcids have been frequently recorded from stem-boring eurytomids in range grasses (Watts and Bellotti 1967). No parasitic chalcids emerged from teff internodes stored in the laboratory nor were any observed in dissected stems. However, since dissection frequently destroyed the enclosed larvae, few adults were reared from the samples. Exit holes observed in plants in the field in July may have been made by parasites of *E. eragrostidis*. A more thorough study would be required to determine if *E. eragrostidis* is parasitized in teff.

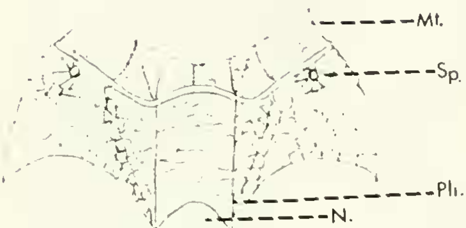
Fig. 1. Exit hole of *Eurytomocharis eragrostidis* in teff.

The apparent reduction in growth due to *E. eragrostidis* may be an important factor influencing the potential of teff for forage production in the northern Great Plains. Forage yields of teff at both locations in 1988 were approximately one-fourth of the forage yields obtained for several years prior to the discovery of infestation by *E. eragrostidis* in 1988. Watts and Bellotti (1967) observed similar stunting symptons in range grasses from which they collected *E. eragrostidis.*

External and reproductive structure morphology.—The following description is based on 19 specimens collected from teff, of which 2 females and 2 males were sent to the United States National Museum for identification.

Female: Head dark black; mesosoma black to reddish black; pronotum, propodeum, petiole, gastor bluish black; antenna with scape yellow (two specimens had dark scape); flagellum yellow, bordered with brown; maxillary palp white; mandibles white; legs with coxae, trochanters, femora and tibia yellow; tarsi yellow; gena carinate, head with fairly deep piliferous punctures dorsally between ocelli extending past posterogenal region; plesosoma with same piliferous punctures; head with frons concave between eyes; antennal scrobes at base of concave frons at or below eye; scape longer than pedicel and first funicular segment together; funicular segments separated by short stalk; club segments fused, 3 in number, first two similar in shape and size to funicular segments, last segment broad at base, narrowing to rounded apex; mesosoma collar broad, edge rounded, without punctures; pronotum with piliferous punctures; scutellum convex, scutoscutellar sulcus continuous, both covered with piliferous punctures; marginal vein broader and longer than postmarginal; parastigma with clear region at attachment to marginal; stigmal subequal to postmarginal, shorter than marginal; submarginal vein with single sensillum behind first dorsal submarginal setae; dorsal parastigma with 2 sensilla, pigmented portion extending anterior of sensilla, the remainder clear with light pigmentation in center; costal cell with single row of dorsal setae, ventral surface with scattered setae; speculum closed; cubital hair line and medial hair line distinct; propodeum (Fig. 3) with light yellow tinge, lighter than scutellum, darker than hind coxae, area near coxae setose, plated, center with shallow furrow, asetose, all plates irregular in shape not punctured as found on scutellum (Fig. 3); Ovipositor (Fig. 2) semicircular sheaths (2nd valvifers) with 2 setae near laminated bridge, rami spines not fixed in number (mean numbers of spines were 36.6 ± 2.1 and 36.8 ± 1.6 for left and right rami of a sample of 6 females); fulcral plate and inner ovipositor plate attached to semicircular sheets; fulcral plate notched with four monitoring spines; attachment of outer ovipositor plate is in-between fulcral plate notch and attachment of fulcral plate and curved ramus edge; outer ovipositor plate fused with eighth tergite; eighth tergite contains button-like cercus with five setae of different sizes and shapes; near cercus a series of setae are found to be dispersed along the eighth tergite, (these are more numerous near the cercus becoming single toward the fulcral plate); eighth tergite setal region plated, bordered by dark line that divides fused outer ovipositor plate into different pigmented areas; apex of eighth tergite with series of long setae; inner ovipositor plate separated from semicircular sheath by darkened region; below darkened region is a groove in which the fulcral plate fits along with monitoring spines; inner ovipositor plate plated to region of fused ovipositor sheath; ovipositor sheath not articulated; ovipositor sheaths lightly plated with longitudial striae with a series of setae at apex.

Male: Color similar to female with head dark black; mesosoma, pronotum, propodeum black; petiole elongated, black; gastor black; ventor dark due to dark coxae in some specimens, other specimens with coxae yellow similar to female; antennae with scape darker than in female; flagellum lighter than body color, with five funicular segments, long setae and well-developed petiole segments; maxillary palp and mandibles yellow; legs with coxae dark, similar in color to body, with some yellow; trochanters, femora and tibia yellow, hind femora with some brown in middle section; tarsi yellow; sculpturing similar to female; wings same as female except medial not distinguished by a single row of setae, rather with 2–3 closely set setae marking region of medial hairline; costal cell same as female; basal setae well-developed, joining cubital hairline closing speculum; male reproductive apparatus (Figs. 4, 5) with aedeagus bilobed, each lobe with 6 sensory pores on ventor; parameres with 2 setae, one associated with apex which is usually hidden between the digiti and the aedeagus, second setae on the narrow arm of the fused parameres, the latter larger than apical setae; single ventral setae located on expanded portion of parameres; digiti with 2 spines, digiti with paired pore-like structures and paired digital apodemes; aedeagal apodemes protrude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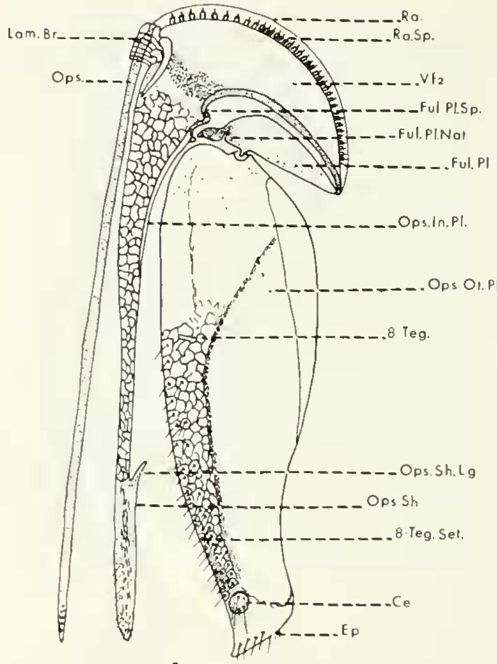
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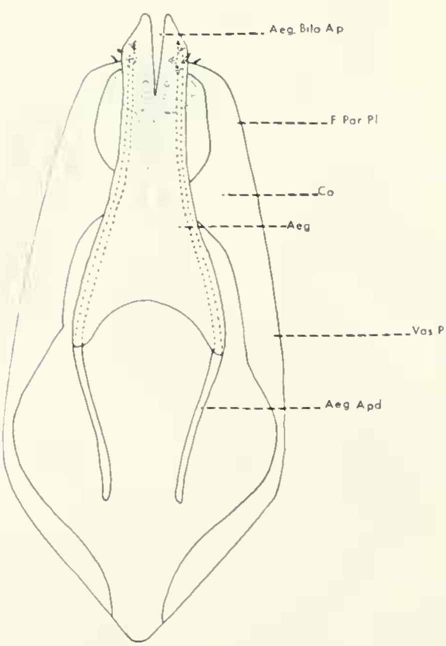
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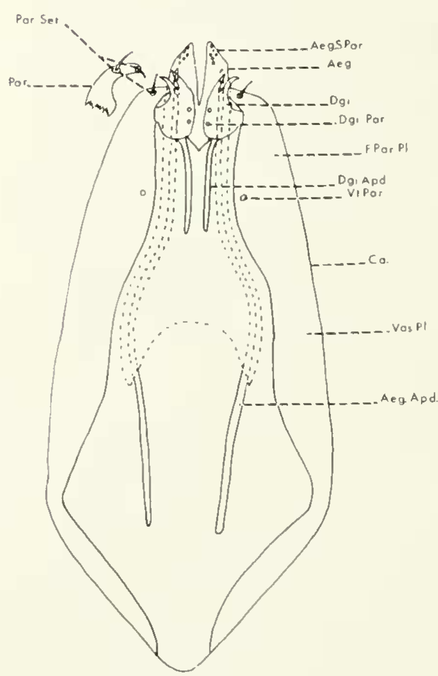
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from caulis; aedeagus dorsally covers digiti and caulis; a covering attached to the eighth tergite is torn away from aedeagus when removing whole male reproductive structure (this structure is covered with small setae and may function in insertion of the aedeagus into the female). At apex of aedeagus on dorsal surface are pigmented raised areas (these raised areas are not the same pigmented pores that are observed on the aedeagus of members of the genus *Bruchophagus*).

Copland and King (1972) stated that the number of rami spines varies with species but did not indicate that they vary within individual females as well as between valvifers of a single female. In *E. eragrostidis* reared from teff the mean number of ramus spines was 36.7. The numbers of left and right ramus spines were equal in only two of the six females examined. The largest difference found between number of left and right ramus spines within an individual female was four (39 on the left ramus and 35 on the right ramus). Rami spines are considered to be sensory in nature, serving to monitor the position of the stylets (Copland and King 1972). They are most widely spaced in the region close to the laminated bridge becoming closer together near attachment of fulcral plate. In a current study of the genus *Bruchophagus*, we have found that the mean number of ramus spines can be used to statistically separate the closely related species that attack leguminous seeds.

Arrangement of eighth tergite setae has been found to be of value in separating closely related species of the genus *Bruchophagus* and may well be a diagnostic structure in separating species of *Eurytomocharis*. However, we have not examined other species of *Eurytomocharis* to determine if setal arrangment differences do exist within the genus.

In *E. eragrostidis* the ovipositor sheaths are connected by a ligament. This ligament is easily torn during slide preparation, giving the appearance that the ovipositor sheaths are not connected. On slide-mounted genitalia the ovipositor sheaths have a lip-like projection that is the broken ovipositor sheath ligament. It is from these projections that the thin ligament is attached connecting the ovipositor sheaths.

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Fig. 2. Ovipositor of *Eurytomocharis eragrostidis* collected from teff in South Dakota. Abbreviations: (Lam. Br.) Laminated bridge; (Ra) Ramus; (Ra. Sp.) Ramus Spines; (Vf2) 2nd valvifer (Semicircular sheath); (Ful. Pl.) Fulcral plate (1st valvifer); (Ful. Pl. Not.) Fulcral plate notch; (Ful. Pl. Sp.) Fulcral plate spines; (Ops. In. Pl.) Ovipositor Inner Plate (3rd valvulae); (Ops. Ot. Pl.) Outer ovipositor plate (8th tergite); (Ops.) Ovipositor (1st & 2nd valvulae); (Ops. Sh.) Ovipositor sheath; (Ops. Sh. Lg.) Ovipositor Sheath Ligament; (Ce.) Cercus; (8-Teg. Set.) 8th tergite setae; (Ep.) Epipygium; (8-teg.) 8th tergite.

Fig. 3. Female propodeum. Abbreviations: (Mt.) Metanotum; (Sp.) Spiracle; (Pli.) Plica; (N.) Nucha (neck).

Figs. 4, 5. Male reproductive apparatus, dorsal, and ventral respectively. Abbreviations: (Aeg. S. Por.) Aedeagal sensory pores; (Aeg.) Aedeagus; (Dgi.) Digiti; (Dgi. Por.) Digiti pore; (F. Par. Pl.) Fused Paramere Plate; (Dgi. Apd.) Digiti apodemes; (Vt. Por.) Ventral Pore; (Ca.) Caulis; (Vos. Pl.) Volsellar Plate; (Aeg. Apd.) Aedeagus apodemes; (Aeg. Bilo. Ap.) Aedeagus Bilobed apex.

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